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(19)

(54) IMPROVEMENTS IN OR RELATING TO PLASTICS MATERIALS

(71) We, DYCEM PLASTICS LIMITED, a British Company, of Chapter Street, Portland Square, Bristol BS2 8SZ, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a solid plastics material having a tacky feel, to methods of making such a material, to methods of coating articles or sheets or webs with such a material, and to articles, sheets or webs thus coated. There is a high coefficient of friction between the material and most other solid materials, so that the material has useful "non-slip" properties, and it is the high coefficient of friction between the material and the skin which causes it to have a tacky feel.

According to this invention there is provided a solid plastics material having a non-adhesive surface with a tacky feel, consisting essential only of an intimate mixture of 25—45% of polyvinyl chloride and 55—75% of a plasticiser.

By this we mean that the material may include only additives which in no way modify its mechanical properties.

The plasticiser may, for example, be a polymer of propylene glycol and adipic acid, di-(2-ethylhexyl) phthalate, or a compound of phthalic anhydride and an alcohol having from 4 to 13 carbon atoms.

We also provide an article having a rigid flat surface, such as a tray, or a sheet or web of absorbent material coated and/or impregnated with the said plastics material. The sheet or web may, for example, be of blotting paper, glass fibres, cotton netting, or synthetic fibres, for instance a composition of 100% viscose rayon and a synthetic rubber binder.

We also provide a process for making the said plastics material comprising heat curing a mixture of 25—45% of polyvinyl chloride and 55—75% of the plasticiser.

We further provide a process for making a coated and/or impregnated sheet or web of absorbent material comprising passing the web or sheet through a bath containing a mixture of 25—45% of polyvinyl chloride and 55—75% of a plasticiser, so that the web becomes coated and/or impregnated with some of the material, and heat curing the mixture on the web by heating the web after it has emerged from the bath.

The curing is preferably carried out at a temperature of at least 140° C., and the temperature of the bath is preferably from —10° C. to 45° C.

Specific embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:—

Fig. 1 is a diagram showing apparatus for coating a continuous web of material,

Fig. 2 shows in perspective a net coated with plastics material in accordance with the invention,

Fig. 3 shows in perspective a tray coated with plastics material in accordance with the invention, and

Fig. 4 is a section, partially broken away, on the line 4—4 of Fig. 3.

Referring first to Fig. 1, a continuous web 12 of fibrous material such as for example paper or an unwoven mat of cotton fibres is supplied for the process from a supply reel 10. The web 12 is directed over roller 11 and past pre-heaters 13. These pre-heaters 13 bring the temperature of web 12 to a temperature of at least 100° C to remove moisture from the web. The heated web is then passed through a bath of polyvinyl chloride and a plasticiser at a temperature lying in the range of —10° C. to 45° C. In this process the plasticiser should be present in

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an amount of 55—75% by weight and the polyvinyl chloride should be present in an amount of 25—45% by weight. After the web 12 has passed through the bath 14 and around rollers 15 and 16, the web is then heated either by curing heaters 17 or by passage through a box containing heated air (not shown) to a temperature of at least 140° C. to cure the coating composition. After curing, the web is wound on a take-up spindle 19. A drive roller 18 is placed between the take-up spindle 19 and the curing heaters 17 to provide tension on the web 12 during the processing steps.

Referring now to Fig. 2, a coated netting includes longitudinal cotton strings 22 interconnected by periodically spaced transverse cotton strings 23. These cotton strings are coated with polyvinyl chloride and plasticiser in the manner of the process illustrated in Fig. 1. The coated netting has been found to be a useful and an inexpensive product to eliminate slipping of, for example, rugs or upholstery. By placing the netting between a rug and the floor, slipping of the rug with respect to the floor is virtually eliminated at very low cost.

Referring now to Figs. 3 and 4, a tray has an edge 32 for grasping which extends around the perimeter of the tray. A side 31 extends from the bottom 34 of the tray to join with the edge 32. On the upper surface of the bottom 34 of the tray there is a coating 33 which contains 25—45% polyvinyl chloride and 55—75% of a plasticiser. The tray is made of a rigid material, preferably steel, and its bottom surface is flat over its entire area.

While there are known well over a hundred plasticisers which are compatible with vinyl chloride polymers, two plasticisers have been found to be particularly suitable for use with vinyl chloride polymers to produce a tacky surface which contributes to the non-slip feature of the products herein disclosed. One of the plasticisers is di-(2-ethylhexyl) phthalate. The preferred plasticiser, because of its superior properties and non-toxic characteristics, is a polymer of propylene glycol and adipic acid. The polymerization of these two compounds is preferably stopped with iso-octanol but virtually any other monohydric alcohol or a monobasic carboxylic acid could be used to prevent the further polymerization.

For commercial purposes it has been determined that 60—66% plasticiser in the final product is most satisfactory. Methods of making different forms of products, each in accordance with the invention, will now be described by way of example.

EXAMPLE I

In apparatus such as that described with reference to Fig. 1 a reel of thin blotting paper was heated to 100° C. in order to remove moisture from it, and was then passed into a bath containing 36% polyvinyl chloride and 64% di-(2-ethylhexyl) phthalate as plasticiser at ambient temperature. Upon emerging from the bath the web of coated paper was heated to a temperature of 160—250° C. by the curing heaters. (The length of time required for curing depends upon the temperature employed e.g. 16 seconds at 160° C. or 8 seconds at 200° C.). Subsequently the coated and cured web was wound on a take-up spindle. The resultant materials had a tacky feeling and when placed between an object on a table and the table, virtually eliminated sliding between the object and the table.

EXAMPLE II

The process of Example I was repeated using a man made fibre — a 100% viscose rayon and a synthetic rubber binder (a styrene butadiene polymer) — instead of the blotting paper. Excellent results were obtained.

EXAMPLE III

The process of Example I was repeated using an iso-octanol chain stopped polypropylene glycol adipate as plasticiser in place of the di-(2-ethylhexyl) phthalate. Excellent results were achieved.

EXAMPLE IV

The process of Example I was repeated using as plasticiser a compound of phthalic anhydride and i-butanol instead of di-(2-ethylhexyl) phthalate.

EXAMPLES V and VI

The processes of Examples I and III were repeated using a cotton net in place of the paper. The resulting coated nets were found to be useful when placed under a rug to eliminate the movement of the rug with respect to the floor.

EXAMPLE VII

A mixture of 38% polyvinyl chloride and 62% di-(2-ethylhexyl) phthalate was spread over the bottom of a tray of the type shown in Figs. 3 and 4. The tray was maintained at a temperature of 180° C. until the mixture of polyvinyl chloride and plasticiser was evenly cured. The tray was maintained in level position and allowed to cool.

A suitable primer (e.g. acrylic granules dissolved in toluene with the addition of 0.01% phosphoric acid) had been applied to the surface of the tray and heated to a temperature lying in the range of 120° C. to 180°C. prior to applying the mixture of polyvinyl chloride and plasticiser to the tray surface.

The curing temperature may be from 140°

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C. to 200° C, depending on the length of time over which curing is carried out e.g. 180° C. for 4 minutes. Curing time depends upon the thickness of the plastics.

EXAMPLE VIII

The procedure of Example VII was followed except that the plasticiser used was an iso-octanol chain stopped polymer of propylene glycol and adipic acid. The trays of Examples VII and VIII had surfaces which were very resistant to slipping. Pencils placed in the centre of the trays remained in position when the trays were inclined at an angle of 60°.

EXAMPLE IX

The process of Example I was repeated except that the blotting paper was not dried before immersion in the bath. The consequent formation and escape of steam bubbles during curing left minute pits and craters in the surface of the plastics material, the material therefore acquiring a surface which was rough as well as tacky.

In the specification and claims, percentages given refer to weights involved.

WHAT WE CLAIM IS:—

1. A solid plastics material having a non-adhesive surface with a tacky feel, consisting essentially only of an intimate mixture of 25—45% of polyvinyl chloride and 55—75% of a plasticiser.

2. A plastics material according to claim 1, wherein the plasticiser is a polymer of propylene glycol and adipic acid.

3. A plastics material according to claim 2, wherein the said polymer of propylene glycol and adipic acid is chain-stopped with iso-octanol.

4. A plastics material according to claim 1, wherein the plasticiser is di-(2-ethylhexyl) - phthalate.

5. A plastics material according to claim 1, wherein the plasticiser is a compound of phthalic anhydride and an alcohol having from 4 to 13 carbon atoms.

6. An article having a rigid flat surface coated with a plastics material according to any one of the preceding claims.

7. A sheet or web of absorbent material coated and/or impregnated with a plastics material according to any one of claims 1 to 5.

8. A coated sheet or web according to claim 7, wherein the absorbent material is a fibrous net.

9. A tray coated with a plastics material according to any of claims 1 to 5.

10. A process for making a plastics material according to any of claims 1 to 5, comprising heat curing a mixture of 25—45% of polyvinyl chloride and 55—75% of the plasticiser.

11. A process for making a coated and/or impregnated sheet or web of absorbent material according to claim 7 or claim 8, comprising passing the web or sheet through a bath containing a mixture of 25—45% of polyvinyl chloride and 55—75% of a plasticiser, so that the web becomes coated and/or impregnated with some of the material, and heat curing the mixture on the web by heating the web after it has emerged from the bath.

12. A process according to claim 10 or claim 11, wherein the curing is carried out at a temperature of at least 140° C.

13. A process according to either of claims 11 or 12, wherein the web or sheet is heated to a temperature of at least 100° C. immediately before being passed through the bath.

14. A process according to any of claims 10 to 13, wherein the bath is at a temperature of from —10° C. to 45° C.

15. An article, sheet or web coated with a plastics material substantially as herein described with reference to the examples and the accompanying drawings.

16. A process of coating and/or impregnating a sheet or web with a plastics material, substantially as herein described with reference to the examples and the accompanying drawings.

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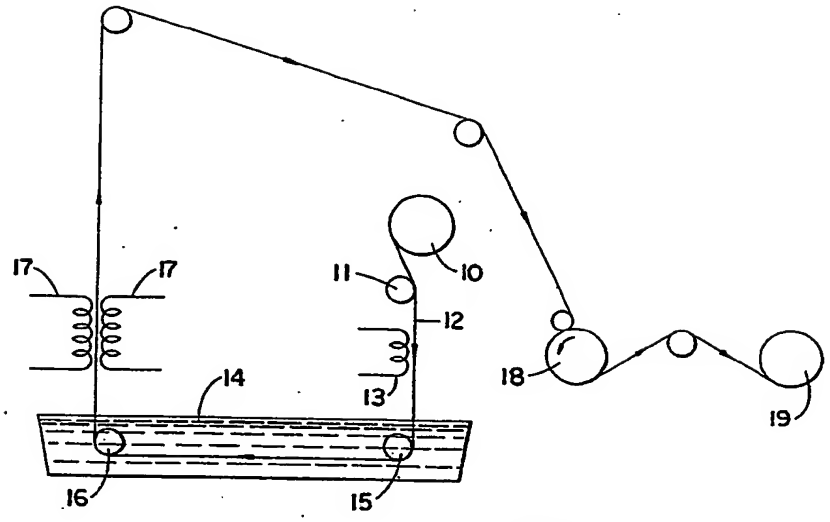

Fig. 1

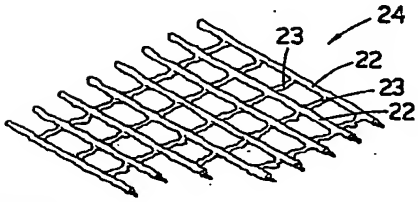

Fig.2

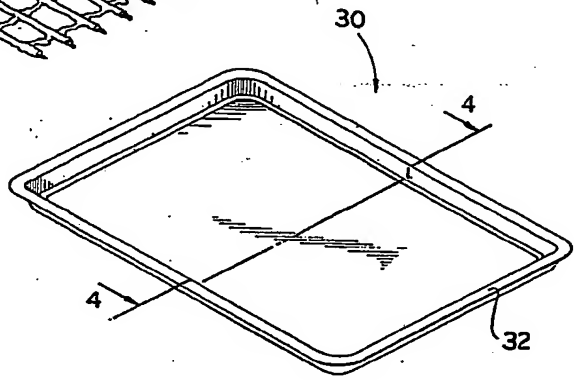

Fig.3

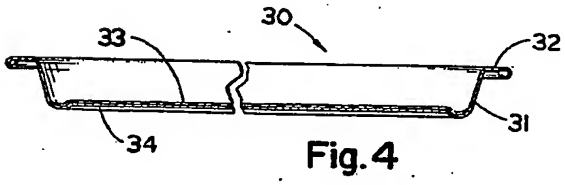

Fig.4

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